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Sertifikaat

PATENTKANTOOR 1999/1747

DEPARTEMENT VAN HANDEL EN NYWERHEID

REPUBLIEK VAN SUID-AFRIKA

REPUBLIC OF SOUTH AFRICA

Certificate

PATENT OFFICE

DEPARTMENT OF TRADE AND INDUSTRY

Hiermee word gesertifiseer dat
This is to certify that the attached documents attached hereto are true copies of the Forms P2, P6, provisional specification and drawings of South African Patent Application No. 99/1831 in the name of BRITS, Willem Hendrik (assigned from IMMALYTICA (PROPRIETARY) LIMITED)

Filed	:	08.03.99
Entitled	:	SLAG SEPARATOR

PRIORITY DOCUMENT

SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

[redacted]

en te PRETORIA in die Republiek van Suid-Afrika, hierdie 12th dag van November 1999
at in the Republic of South Africa, this day of

Registrateur van Patente
Registrar of Patents

FORM P.2

REPUBLIC OF SOUTH AFRICA | REGISTER OF PATENTS | PATENTS ACT,

OFFICIAL APPLICATION	LODGING DATE: PROVISIONAL	ACCEPTANCE DATE
21 01 991831	22 8 MARCH 1999	47
INTERNATIONAL CLASSIFICATION	LODGING DATE: COMPLETE	GRANTED DATE
51	23	

FULL NAME(S) OF APPLICANT(S)/PATENTEE(S)

71 ~~IMMALYTICA (PTY) LTD~~

AANSOEKERS VERVANG
APPLICANTS SUBSTITUTED

APPLICANTS SUBSTITUTED:	DATE REGISTERED
71 Willem Hendrik Brits	22.10.99

ASSIGNEE(S)	DATE REGISTERED
71	

FULL NAME(S) OF INVENTOR(S)

72 WILLEM HENDRIK BRITS

PRIORITY CLAIMED	COUNTRY	NUMBER	DATE
N.B. Use International abbreviation for country (see Schedule 4)	33 NONE	31 NONE	32 NONE

TITLE OF INVENTION

54 SLAG SEPARATOR

ADDRESS OF APPLICANT(S)/PATENTEE(S)

29 BOEKENHOUT STREET, DALPARK, EXT 5, BRAKPAN, SOUTH AFRICA

ADDRESS FOR SERVICE	S AND F REF
74 SPOOR AND FISHER, SANDTON	JP/I 182/DC/acm

PATENT OF ADDITION NO.	DATE OF ANY CHANGE
61	

FRESH APPLICATION BASED ON	DATE OF ANY CHANGE

SPOOR AND FISHER

FORM P.1

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978
APPLICATION FOR A PATENT
AND ACKNOWLEDGEMENT OF RECEIPT
(Section 30 (1) – Regulation 22)

REPUBLIC OF SOUTH AFRICA REVENUE 09.03.99 R 60.00

The granting of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

OFFICIAL APPLICATION NO.			S AND F REFERENCE
21	01	991831	JP/I 182/DC/acm

FULL NAME(S) OF APPLICANT(S)

71	~~IMMALYTICA (PTY) LTD~~ ~~AANGEKEERS VEEMANG~~ Willem Hendrik Brits (22-10-99)

APPLICANTS SUBSTITUTED

ADDRESS(ES) OF APPLICANT(S)

	~~29 BOEKENHOUT STREET, DALPARK, EXT 5, BRAKPAN, SOUTH AFRICA~~ 2 ✓

TITLE OF INVENTION

54	SLAG SEPARATOR

THE APPLICANT CLAIMS PRIORITY AS SET OUT ON THE ACCOMPANYING FORM P.2 THE EARLIEST PRIORITY CLAIM IS:

COUNTRY:	NUMBER:	DATE:
NONE	NONE	NONE

~~THIS APPLICATION IS FOR A PATENT OF ADDITION TO PATENT APPLICATION NO.~~

21	01	

~~THIS APPLICATION IS A FRESH APPLICATION IN TERMS OF SECTION 37 AND IS BASED ON APPLICATION NO.~~

21	01	

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1. A single copy of a provisional ~~or two copies of a complete~~ specification of 9 pages.
- ☒ 2. Drawings of 2 sheets.
- ☐ 3. Publication particulars and abstract (Form P.8 in duplicate).
- ☐ 4. A copy of Figure of the drawings (if any) for the abstract.
- ☐ 5. An assignment of invention.
- ☐ 6. Certified priority document(s) .
- ☐ 7. Translation of the priority document(s).
- ☐ 8. An assignment of priority rights.
- ☐ 9. A copy of the Form P.2 and the specification of S.A. Patent Application No.
- ☐ 10. A declaration and power of attorney on Form P.3.
- ☐ 11. Request for ante-dating on Form P.4.
- ☐ 12. Request for classification on Form P.9.
- ☒ 13. Form P.2 in duplicate.

74 ADDRESS FOR SERVICE: SPOOR AND FISHER, SANDTON

Dated: 8 MARCH 1999

SPOOR AND FISHER
PATENT ATTORNEYS FOR THE APPLICANT(S)

RECEIVED
REGISTRAR OF PATENTS, DESIGNS, TRADE MARKS AND COPYRIGHT
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1999 -03- 09
PRETORIA 0001
REGISTRATEUR VAN PATENTE, MODELLE, HANDELSMERKE EN OUTEURSREGTE
REGISTRAR OF PATENTS

SPOOR AND FISHER

FORM P.6

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO.		LODGING DATE	
21 01	991831	22	8 MARCH 1999

FULL NAME(S) OF APPLICANT(S)

71	~~IMMALYTICA (PTY) LTD~~ Willem Hendrik Brits. 22-10-99

ANNEXURE A NOT APPLICANTS SUBSTITUTED

FULL NAME(S) OF INVENTOR(S)

72	WILLEM HENDRIK BRITS

TITLE OF INVENTION

54	SLAG SEPARATOR

BACKGROUND OF THE INVENTION

This invention relates to a separator for separating lead from slag in a fire assay process.

In order to plan and manage mining operations and to estimate recoverable ore reserves it is necessary to have the facility to determine the concentration in ore samples of precious metals, typically gold and PGMs (platinum group metals including platinum, palladium, rhodium, osmium, indium and ruthenium). It is already known to use a fire assay process for this purpose. In fire assay, PGMs and gold are separated from gangue materials by collection into either lead or nickel sulphide at temperatures of around 1200 - 1450°C. This is achieved by mixing an aliquot of the sample with a flux containing either lead oxide, for the lead collection, or a combination of nickel carbonate and sulphur, for the nickel sulphide, with other chemicals. This mixture is placed into a ceramic crucible,

which in turn is placed into an electric or gas fired furnace and heated to an appropriate temperature for a period of about 90 minutes. During this time the mixture melts and, because their chemical affinity, PGMs and gold are collected into either lead or nickel sulphide. On cooling the lead or nickel sulphide is separated from the gangue material and the PGMs and gold content determined by a number of analytical techniques.

The advantage of Fire Assay collection over other analytical procedures, is that it effectively concentrates PGMs and gold from a large sample aliquot into a media which is much more amenable to further treatment for the separation and analysis of the PGMs and gold. Fire Assay is, therefore, used extensively in all laboratories engaged in the analysis of samples containing precious metals and, indeed, is an essential stage in the analysis of lower grade samples such as concentrates, feed and tails.

However, the recovery of lead from the fusion slag is hazardous as the slag is broken up, usually manually, by impact to liberate globules of lead entrapped in the slag. Slivers of slag are sharp and necessitate the wearing of adequate safety equipment. Generally, not all lead globules are usually liberated from the slag, leading to an inevitable loss of lead.

Current assay techniques are labour intensive and, therefore, prone to human error. The average time taken to complete an assay normally exceeds twelve hours. It is desired to improve the accuracy, the turnaround time and the safety aspects of known prior art assaying techniques.

SUMMARY OF THE INVENTION

According to the invention there is provided a receptacle for separating molten lead from slag, the receptacle comprising a base with a side wall extending from the base, the side wall defining a top opening into the receptacle, and the side wall having a cavity therein adjacent the base, wherein the cavity is sized to collect a predetermined amount of molten lead.

Advantageously, the cavity is tubular.

Preferably, the tubular cavity is oriented perpendicular relative to the side wall of the receptacle.

Preferably, the receptacle comprises heating means.

Typically, the heating means is a wire element which is wrapped around the side wall of the receptacle.

Advantageously, the receptacle is formed from clay.

According to another aspect of the invention there is provided a method for separating molten lead from slag, in the receptacle described above, the method including the steps of:

1. introducing a slag with a predetermined amount of molten lead therein into the receptacle;

2. rotating the receptacle in a first direction toward the cavity so that the molten lead fills and is retained within the cavity,

rotating the receptacle further so that the slag is discharged from the opening to the receptacle;

3. rotating the receptacle in a second direction, opposite to the first direction so that the molten lead flows out of the cavity and is discharged out of the opening to the receptacle; and

4. collecting the lead.

Preferably, the receptacle is heated to a temperature of 600 to 800°C during steps 1 and 3.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which Figures 1 to 3 illustrate an embodiment of the invention.

Figure 1 is a cross-sectional view of a receptacle according to the invention for separating lead from slag;

Figure 2 is a schematic side plan view of an apparatus according to the invention for separating lead from slag; and

Figure 3 is a schematic side plan view of an apparatus according to the invention for making a lead button from lead separated by the receptacle shown in Figure 2.

DESCRIPTION OF AN EMBODIMENT

Co-pending South African provisional patent application no. 98/9866, incorporated herein by reference, describes a method of assaying ore. The method includes the steps of preparing an ore sample, mixing the ore sample with a flux which includes a predetermined amount of lead oxide, to form a mixture, inductively heating the mixture to form a fusion of slag and predetermined amount of lead containing gold and PGM's. The method and apparatus according to this invention is for separating the predetermined amount of lead from the slag. Thereafter the amount of gold and PGM's in the lead may be determined by way of various forms of analysis.

Referring to Figure 1, there is provided a receptacle 10 for separating lead from slag. The receptacle 10 is in the form of a clay pot having a base 12 and a side wall 14 extending from the base. The side wall 14 defines a top opening 16 into the receptacle 10. The clay pot is made from a mixture is alumina, silica and zirconia. In this example, the base 12 is 10cm in diameter and the side wall 14 is 15cm in height.

A cavity 18 is provided in the side wall 14 adjacent the base 12. The cavity 18 is tubular in shape, is oriented perpendicular relative to the side wall 14, and is sized to accommodate only a predetermined amount of molten lead (ie. the amount of lead in a molten assay sample). In this example, the cavity 18 is sized to accommodate only 64g of lead prepared from a flux containing 70g of lead oxide.

The outside surface of the side wall 14 is provided with a series of grooves 20 and a wire element 22 is wound around the side wall in the grooves 20. The

wire element 22 is connected to an electrical supply and when energized, it heats the receptacle 14 to a temperature of between 600 and 800 C.

Referring to Figure 2, a receptacle 10 as described in Figure 1 is housed within a container 24 which is insulated with ceramic fibre. The container 24 is pivotally mounted on arms 26 and 28. An actuator (not shown) is provided for rotating the container 24 and receptacle 10 clockwise and anti-clockwise. The container 24 is connected to a hydraulic cylinder 30 via an arm 32. The hydraulic cylinder 30 and arm 32 are provided for moving the container 24 and receptacle 10 into the following positions:

Position A

a) Position A is the first position, located away from a melting head 36, (such as that described in co-pending South African patent application no. 98/9866). The melting head 36 heats a sample of ore and flux by way of induction heating. At position A the wire element 22 on the receptacle 10 is not affected by eddie waves from the melting head 36.

Position B

b) After the sample and ore have been melted in the melting head and the induction furnace is turned off, the container 24 is moved to position B adjacent the melting head and rotated anti-clockwise to an angle of approximately -30° (relative to 0° in an upright position), as shown in Figure 2. Molten slag and lead is poured from the melting head 36 into the receptacle 10,which is

heated to a temperature of 600 to 800°C by the wire element 22 to ensure that the slag and lead remain molten.

Position C

c) The container 24 is then moved by way of hydraulic cylinder 30 to position C above a discharge bin 37. At this position the container 24 is rotated via the actuator anti-clockwise towards the cavity 18 in the receptacle 10. Molten lead within the receptacle 10 is more dense than the slag and is collected in the and fills the cavity 18. The container 24 is then rotated further to about -160° and slag flows out of the receptacle through the opening 16 into the discharge bin 36. The molten lead remains within the cavity 18 and is thus separated from the slag.

Position D

d) The container is rotated clockwise into an upright position and the cylinder 30 moves the container 24 to position D. At position D the container 24 is rotated clockwise to about +160° and the separated lead flows out of the receptacle through the opening 16 into a water cooled mould 40 which is chilled to a temperature of about 10°C.

Referring to Figure 3, the molten lead 42 in the mould 40 solidifies within 5 to 10 seconds to form a lead button. The mould 40 is connected to an actuator 44 which is arranged to invert the mould 40 to drop the lead button 42 onto a tray 46. First and second automated forks 50 and 52 are provided for centering the button on the tray 46. Once centered the button is stamped with an

identification code via a stamp 54. Thereafter the button is moved into a discharge hole 48 in the tray 46 by way of the first fork 50 for further processing.

As mentioned in co-pending South African provisional patent application no. 98/9866, the rapid cooling of the lead stops gold and PGM's within the lead from forming layers and ensures that the concentration of gold and PGM's within the button is homogenous. This is useful for analysing the lead and it is believed that the lead buttons could be analysed by SAFT analysis.

DATED THIS 8TH DAY OF MARCH 1999

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APPLICANTS PATENT ATTORNEYS

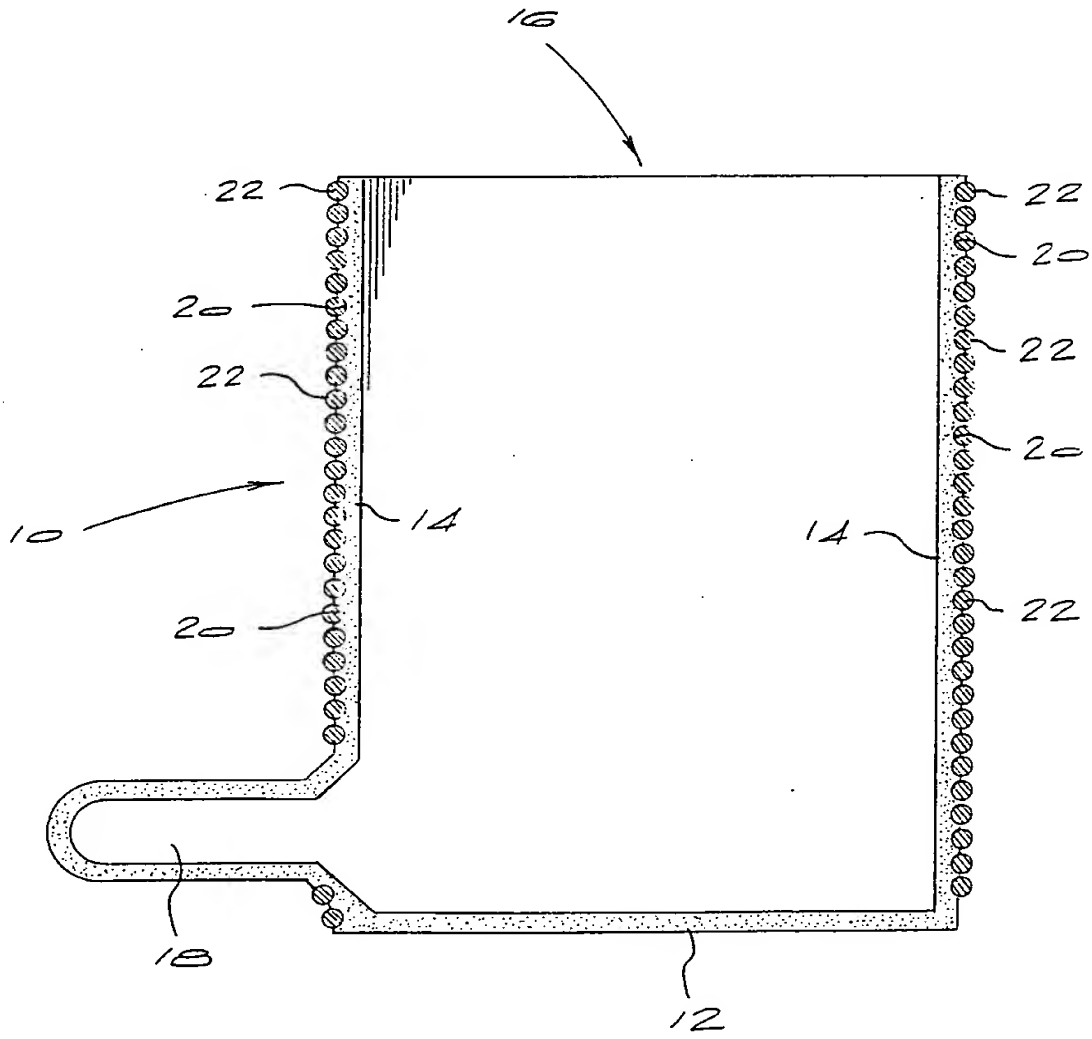

FIG 1

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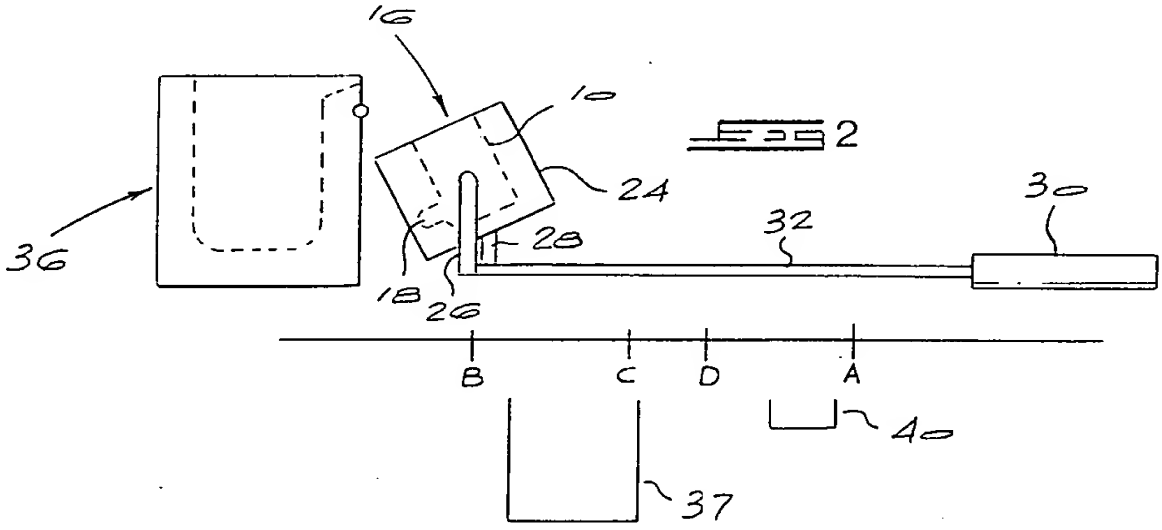

FIG 2

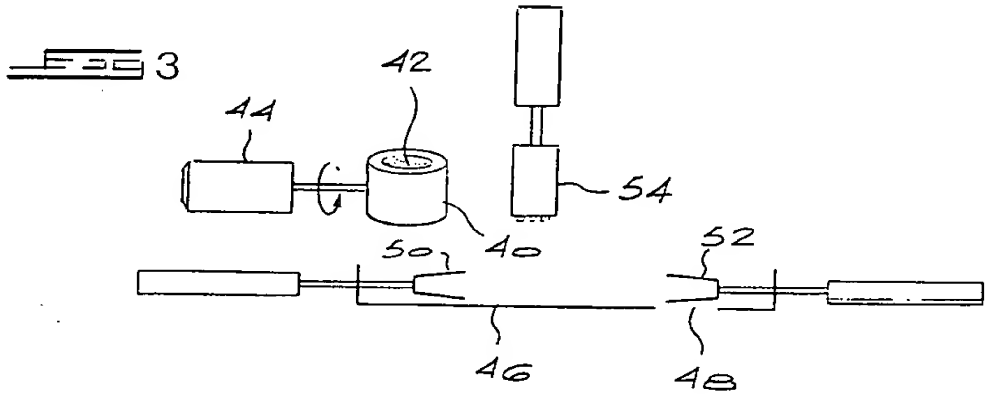

FIG 3

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